

PATENT COOPERATION TREATY

From the:
INTERNATIONAL PRELIMINARY EXAMINING AUTHORITY

To:

A J PARK & SON
PO Box 949
WELLINGTON 6001
New Zealand

PCT

WRITTEN OPINION

(PCT Rule 66)

Date of mailing
(day/month/year) **27 OCT 2000**

Applicant's or agent's file reference
P402168/TJH

REPLY DUE within **TWO MONTHS**
from the above date of mailing *-diarise*

International application No:
PCT/NZ99/00025

International filing date (day/month/year)
26 February 1999

Priority Date (day/month/year)
26 February 1999

International Patent Classification (IPC) or both national classification and IPC

Int. Cl. ⁷ **E04G 1/02, 1/12, E04C 3/28**

Applicant

WUI LOONG SYSTEM SCAFFOLDS COMPANY LIMITED et al

1. This written opinion is the **first** drawn by this International Preliminary Examining Authority.
2. This opinion contains indications relating to the following items:

I	<input checked="" type="checkbox"/>	Basis of the opinion
II	<input type="checkbox"/>	Priority
III	<input type="checkbox"/>	Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
IV	<input checked="" type="checkbox"/>	Lack of unity of invention
V	<input checked="" type="checkbox"/>	Reasoned statement under Rule 66.2(a)(ii) with regard to novelty, inventive step or industrial applicability, citations and explanations supporting such statement
VI	<input type="checkbox"/>	Certain documents cited
VII	<input checked="" type="checkbox"/>	Certain defects in the international application
VIII	<input type="checkbox"/>	Certain observations on the international application

The applicant is hereby invited to reply to this opinion.

When? See the time limit indicated above. The applicant may, before the expiration of that time limit, request this Authority to grant an extension, see Rule 66.2(d).

How? By submitting a written reply, accompanied, where appropriate, by amendments, according to Rule 66.3. For the form and the language of the amendments, see Rules 66.8 and 66.9.

Also For an additional opportunity to submit amendments, see Rule 66.4.
For the examiner's obligation to consider amendments and/or arguments, see Rule 66.4bis.
For an informal communication with the examiner, see Rule 66.6.

If no reply is filed, the international preliminary examination report will be established on the basis of this opinion.

4. The final date by which the international preliminary examination report must be established according to Rule 69.2 is: **26 June 2001**

Name and mailing address of the IPEA/AU

AUSTRALIAN PATENT OFFICE
PO BOX 200, WODEN ACT 2606, AUSTRALIA
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Authorized Officer

GEOFF SADLIER
Telephone No. (02) 6283 2114

I. Basis of the opinion

1. With regard to the elements of the international application:*

- ☒ the international application as originally filed.
- ☐ the description, pages , as originally filed,
 pages , filed with the demand,
 pages , received on with the letter of
- ☐ the claims, pages , as originally filed,
 pages , as amended under Article 19,
 pages , filed with the demand,
 pages , received on with the letter of
- ☐ the drawings, pages , as originally filed,
 pages , filed with the demand,
 pages , received on with the letter of
- ☐ the sequence listing part of the description:
 pages , as originally filed
 pages , filed with the demand
 pages , received on with the letter of

2. With regard to the language, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

These elements were available or furnished to this Authority in the following language which is:

- ☐ the language of a translation furnished for the purposes of international search (under Rule 23.1(b)).
- ☐ the language of publication of the international application (under Rule 48.3(b)).
- ☐ the language of the translation furnished for the purposes of international preliminary examination (under Rules 55.2 and/or 55.3).

3. With regard to any nucleotide and/or amino acid sequence disclosed in the international application, the written opinion was drawn on the basis of the sequence listing:

- ☐ contained in the international application in printed form.
- ☐ filed together with the international application in computer readable form.
- ☐ furnished subsequently to this Authority in written form.
- ☐ furnished subsequently to this Authority in computer readable form.
- ☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
- ☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. ☐ The amendments have resulted in the cancellation of:

- ☐ the description, pages
- ☐ the claims, Nos.
- ☐ the drawings, sheets/fig.

5. ☐ This opinion has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).

** Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this opinion as "originally filed"*

IV. Lack of unity of invention

1. In response to the invitation (Form PCT/IPEA/405) to restrict or pay additional fees the applicant has:

- ☐ restricted the claims.
- ☐ paid additional fees.
- ☐ paid additional fees under protest.
- ☐ neither restricted nor paid additional fees.

2. This Authority found that the requirement of unity of invention is not complied with for the following reasons and chose, according to Rule 68.1, not to invite the applicant to restrict or pay additional fees:

The international application does not comply with the requirements of unity of invention because it does not relate to one invention or to a group of inventions so linked as to form a single general inventive concept. In coming to this conclusion the International Searching Authority has found that there are different inventions as follows:

1. Claims 1-22 are directed to a structural scaffolding member and its method of production. It is considered that being formed from reinforced plastic and having a gripping surface on the external periphery comprises a first "special technical feature".
2. Claims 23-39 are directed to a structural member and its method of production. It is considered that the presence of surface protrusions or nodes comprises a second "special technical feature".

Since the abovementioned groups of claims do not share any of the technical features identified, a "technical relationship" between the inventions, as defined in PCT rule 13.2 does not exist. Accordingly the international application does not relate to one invention or to a single inventive concept, a priori.

3. Consequently, the following parts of the international application were the subject of international preliminary examination in establishing this report:

- ☒ all parts.
- ☐ the parts relating to claims Nos.

V. Reasoned statement under Rule 66.2(a)(ii) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Claims 2-9, 12, 14-20, 24-29, 32-37	YES
	Claims 1, 10, 11, 13, 21-23, 30, 31, 38, 39	NO
Inventive step (IS)	Claims 2-9, 12, 14-20, 25-29, 33-37	YES
	Claims 1, 10, 11, 13, 21-24, 30-32, 38, 39	NO
Industrial applicability (IA)	Claims 1-39	YES
	Claims	NO

2. Citations and explanations

The following documents identified in the International Search Report have been considered for the purposes of this report:

D1 - GB 2282096

D2 - FR 2229015

D3 - US 5566985

D4 - JP 10178948 (Derwent abstract)

Novelty (N) Claims 1, 10, 11, 13, 21-23, 30, 31, 38 and 39.

Claims 1-22 are directed to a structural scaffolding member and its method of production. The scaffolding is formed from reinforced plastic material and is provided with a gripping surface on an external periphery.

Document D1 discloses a scaffolding tube formed from fibre reinforced plastic material (see page 3, paragraph 1) having an outer surface that is contoured with annular corrugations which form alternating ribs and grooves which provide a gripping surface for clamps and the like. The subject matter of claims 1, 10, 11, 13, 21 and 22 is therefore known from D1 and consequently these claims fail to meet the requirements of Article 33(2) PCT with regard to novelty.

Claims 23-39 are not limited to scaffolding devices, but define a more general purpose structural member and its method of production. The structural member is provided with surface protrusions or nodes at its external periphery.

Document D3 relates to fibreglass piping having threaded ends adjacent to which the external surfaces are slightly enlarged to provide stronger sections. These sections form protrusions or nodes which are covered with an outer layer of integrally embedded sand which serves to improve the gripping ability of the nodes. The subject matter of claims 23 and 31 is therefore known from D3 and consequently these claims fail to meet the requirements of Article 33(2) PCT with regard to novelty.

Document D4 discloses a plastic cylinder having bamboo-like joints. The joints are formed so as to protrude from the outer peripheral surface of the cylinder bodies and may be wound with a fibre material for reinforcing. The subject matter of claims 30, 38 and 39 is therefore known from D4 and consequently these claims fail to meet the requirements of Article 33(2) PCT with regard to novelty.

The remaining claims meet the criteria set forth in PCT Article 33(2)-(4) for novelty. The prior art published before the priority date does not disclose protrusions formed by a process of winding reinforcements as defined by these claims.

Continued in a supplemental box.

VII. Certain defects in the international application

The following defects in the form or contents of the international application have been noted:

Claims 40 and 41 do not comply with Rule 6.2(a) because the claims should not rely on references to the description or the drawings.

WRITTEN OPINION

International application No.

PCT/NZ99/00025

Supplemental Box

(To be used when the space in any of the preceding boxes is not sufficient)

Continuation of Box V

Inventive Step (IS) Claims 1, 10, 11, 13, 21-24 30-32 38, 39.

Claims 1, 10, 11, 13, 21-23 30, 31, 38, 39: - as above

Document D2 provides a plastic bar for scaffolding or safety barriers and includes exterior ribs which allow the gripping of cross pieces. Claims 1 and 13 differ from D2 by the use of fibre reinforced plastic, however fibre reinforced plastic is well known in the art and the choice of a material is a matter of routine design procedure therefore the subject matter of these claims would be obvious to a person skilled in the art and consequently fails to meet the requirements of Article 33(3) PCT with regard to the requirement for inventive step.

Claims 24 and 32 differ from D3 by the use of reinforced plastic material as opposed to fibreglass. However for the same reasons discussed above these claims also fail to include an inventive step.

Claims 2-9, 12, 14-20, 25-29, 33-37 are not obvious in the light of any of the cited documents nor disclosed in any obvious combination, nor would these claims be obvious to a person skilled in the art in the light of common general knowledge by itself or in combination with any of these documents.

PATENT COOPERATION TREATY
PCT
INTERNATIONAL PRELIMINARY EXAMINATION REPORT
(PCT Article 36 and Rule 70)

Applicant's or agent's file reference P402168 TJH/dah	FOR FURTHER ACTION	See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416).
International Application No. PCT/NZ99/00025	International Filing Date (<i>day/month/year</i>) 26 February 1999	Priority Date (<i>day/month/year</i>) 26 February 1999
International Patent Classification (IPC) or national classification and IPC Int. Cl. ⁷ E04G 1/02, 1/12, E04C 3/28		
Applicant WUI LOONG SYSTEM SCAFFOLDS COMPANY LIMITED et al		

1.	This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.
2.	This REPORT consists of a total of 5 sheets, including this cover sheet. <input checked="" type="checkbox"/> This report is also accompanied by ANNEXES, i.e., sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT). These annexes consist of a total of 8 sheet(s).
3.	This report contains indications relating to the following items: I <input checked="" type="checkbox"/> Basis of the report II <input type="checkbox"/> Priority III <input type="checkbox"/> Non-establishment of opinion with regard to novelty, inventive step and industrial applicability IV <input checked="" type="checkbox"/> Lack of unity of invention V <input checked="" type="checkbox"/> Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement VI <input type="checkbox"/> Certain documents cited VII <input type="checkbox"/> Certain defects in the international application VIII <input type="checkbox"/> Certain observations on the international application

Date of submission of the demand 26 September 2000	Date of completion of the report 30 May 2001
Name and mailing address of the IPEA/AU AUSTRALIAN PATENT OFFICE PO BOX 200, WODEN ACT 2606, AUSTRALIA E-mail address: pct@ipaustalia.gov.au Facsimile No. (02) 6285 3929	Authorized Officer GEOFF SADLIER Telephone No. (02) 6283 2114

I. Basis of the report**1. With regard to the elements of the international application:***

- ☐ the international application as originally filed.
- ☒ the description, pages 1, 3, 4, 8, 9, as originally filed,
pages , filed with the demand,
pages 2, 5-7, received on 24 May 2001 with the letter of 24 May 2001
- ☒ the claims, pages , as originally filed,
pages , as amended (together with any statement) under Article 19,
pages , filed with the demand,
pages 10-13, received on 24 May 2001 with the letter of 24 May 2001
- ☒ the drawings, pages 1, 2, as originally filed,
pages , filed with the demand,
pages , received on with the letter of
- ☐ the sequence listing part of the description:
pages , as originally filed
pages , filed with the demand
pages , received on with the letter of

2. With regard to the language, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

These elements were available or furnished to this Authority in the following language which is:

- ☐ the language of a translation furnished for the purposes of international search (under Rule 23.1(b)).
- ☐ the language of publication of the international application (under Rule 48.3(b)).
- ☐ the language of the translation furnished for the purposes of international preliminary examination (under Rules 55.2 and/or 55.3).

3. With regard to any nucleotide and/or amino acid sequence disclosed in the international application, was on the basis of the sequence listing:

- ☐ contained in the international application in written form.
- ☐ filed together with the international application in computer readable form.
- ☐ furnished subsequently to this Authority in written form.
- ☐ furnished subsequently to this Authority in computer readable form.
- ☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
- ☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished

4. ☐ The amendments have resulted in the cancellation of:

- ☐ the description, pages
- ☐ the claims, Nos.
- ☐ the drawings, sheets/fig.

5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).**

* Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rules 70.16 and 70.17).

** Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report

IV. Lack of unity of invention

1. In response to the invitation to restrict or pay additional fees the applicant has:

- ☐ restricted the claims.
- ☐ paid additional fees.
- ☐ paid additional fees under protest.
- ☐ neither restricted nor paid additional fees.

2. ☐ This Authority found that the requirement of unity of invention is not complied with and chose, according to Rule 68.1, not to invite the applicant to restrict or pay additional fees.

3. This Authority considers that the requirement of unity of invention in accordance with Rules 13.1, 13.2 and 13.3 is

- ☐ complied with.
- ☒ not complied with for the following reasons:

The international application does not comply with the requirements of unity of invention because it does not relate to one invention or to a group of inventions so linked as to form a single general inventive concept. In coming to this conclusion the International Searching Authority has found that there are different inventions as follows:

1. Claims 1-22 are directed to a structural scaffolding member and its method of production. It is considered that being formed from reinforced plastic and having a gripping surface in the form of surface roughness on the external periphery comprises a first "special technical feature".
2. Claims 23-36 are directed to a structural member and its method of production. It is considered that the presence of surface protrusions or nodes comprises a second "special technical feature".

Since the abovementioned groups of claims do not share any of the technical features identified, a "technical relationship" between the inventions, as defined in PCT rule 13.2 does not exist. Accordingly the international application does not relate to one invention or to a single inventive concept, a priori.

4. Consequently, the following parts of the international application were the subject of international preliminary examination in establishing this report:

- ☒ all parts.
- ☐ the parts relating to claims Nos.

V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**1. Statement**

Novelty (N)	Claims 1-36	YES
	Claims	NO
Inventive step (IS)	Claims 1-36	YES
	Claims	NO
Industrial applicability (IA)	Claims 1-36	YES
	Claims	NO

2. Citations and explanations (Rule 70.7)

The following documents identified in the International Search Report have been considered for the purposes of this report:

D1 - GB 2282096
D2 - FR 2229015
D3 - US 5566985
D4 - JP 10178948 (Derwent abstract)

Novelty (N)

Independent claims 1 and 13 are directed to a structural scaffolding member and its method of production. The scaffolding is formed from reinforced plastic material and is provided with a gripping surface in the form of surface roughness on an external periphery.

Document D1 discloses a scaffolding tube formed from fibre reinforced plastic material (see page 3, paragraph 1) having an outer surface that is contoured with annular corrugations which form alternating ribs and grooves which provide a gripping surface for clamps and the like.

Document D2 provides a plastic bar for scaffolding or safety barriers and includes exterior ribs which allow the gripping of cross pieces.

Claims 1-22 are distinguished from D1 and D2 by the presence of surface roughness forming a gripping surface. Therefore the subject matter of these claims is new and meets the requirements of Article 33(2) PCT with regard to the requirement for novelty.

Independent claims 23 and 30 are not limited to scaffolding devices, but define a more general purpose structural member and its method of production. The structural member is provided with surface protrusions or nodes at its external periphery.

Document D3 relates to fibreglass piping having threaded ends adjacent to which the external surfaces are slightly enlarged to provide stronger sections. These sections form protrusions or nodes which are covered with an outer layer of integrally embedded sand which serves to improve the gripping ability of the nodes.

Document D4 discloses a plastic cylinder having bamboo-like joints. The joints are formed so as to protrude from the outer peripheral surface of the cylinder bodies in the form of a joint guard.

Continued on supplemental sheet

Supplemental Box

(To be used when the space in any of the preceding boxes is not sufficient)

Continuation of V

Claims 23-36 are distinguished from D1-D4 by the presence one or more formers placed on the substrate layer with an outer layer of structural material integrally adhered to the substrate layer so as to provide the node formations. Therefore the subject matter of these claims is also new and meets the requirements of Article 33(2) PCT with regard to the requirement for novelty.

Inventive Step (IS)

Claims 1-36 are not obvious in the light of any of the cited documents nor disclosed in any obvious combination, nor would these claims be obvious to a person skilled in the art in the light of common general knowledge by itself or in combination with any of these documents.

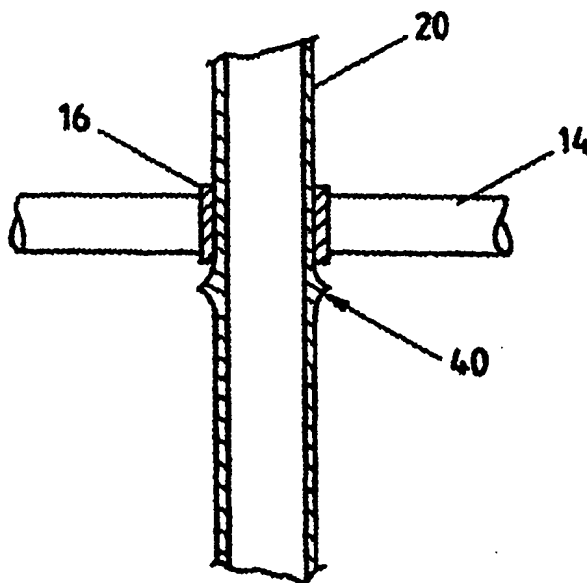


INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification ⁶ : E04G 1/02, 1/12, E04C 3/28	A1	(11) International Publication Number: WO 00/50708 (43) International Publication Date: 31 August 2000 (31.08.00)
(21) International Application Number: PCT/NZ99/00025 (22) International Filing Date: 26 February 1999 (26.02.99) (71) Applicant (for all designated States except US): WUI LOONG SYSTEM SCAFFOLDS COMPANY LIMITED [-/CN]; Pacific Link Tower Southmark, 6th floor, Room 601-5, 11 Yip Hing Street, Aberdeen, Wong Chuk Hang, Hong Kong (CN). (71) Applicant (for SL only): THOMSON, Keith, Charles [NZ/NZ]; 32 Tinakora Road, Thorndon, Wellington (NZ). (72) Inventor; and (75) Inventor/Applicant (for US only): SO, Yu, Shing [-/CN]; Pacific Link Tower Southmark, 6th floor, Room 601-5, 11 Yip Hing Street, Aberdeen, Wong Chuk Hang, Hong Kong (CN). (74) Agents: CALHOUN, Douglas, C. et al.; A J Park & Son, Huddart Parker Building, 6th floor, Post Office Square, P.O. Box 949, Wellington 6015 (NZ).		(81) Designated States: AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CU, CZ, DE, DK, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, UA, UG, US, UZ, VN, YU, ZW, ARIPO patent (GH, GM, KE, LS, MW, SD, SL, SZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG). Published <i>With international search report.</i>

(54) Title: SCAFFOLDING MEMBER AND PRODUCTION METHOD**(57) Abstract**

A scaffolding member (20) formed of reinforced plastic material with appropriate levels of strength and stiffness. The scaffolding member (20) has a gripping surface on the external periphery thereof, preferably although not exclusively formed by the application of a layer of sand (34). A method of forming the scaffolding member (20) is also described. A scaffolding member (20) includes a substrate layer (22) having one or more protrusions (24). An outer layer (26, 28 or 32) is adhered to the substrate layer to form one or more nodes (40) at the external periphery by the presence of the one or more protrusions (24). A structural member (20) may be formed of reinforced plastics material wound to define one or more nodes (40) at the external periphery thereof.



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SCAFFOLDING MEMBER AND PRODUCTION METHOD

Field of the Invention

5 The present invention relates to methods for producing structural scaffolding members. In particular, although not exclusively, the invention relates to structural scaffolding members made from reinforced plastics material by a process of filament winding. However, the invention also relates to methods of forming structural members which may
10 have other uses beyond scaffolding structures. For example the structural members may have application in the building of temporary bridges or buildings. Scaffolding members and structural members are also within the scope of the present invention.

Background to the Invention

15 In western countries the use of timber in scaffolding structures was prevalent in the early part of the twentieth century. Due to the high number of industrial accidents and fire hazards arising from timber scaffolding, timber scaffolding has generally been replaced worldwide by steel tubular scaffolding.

20 However, in Asia, bamboo has been traditionally used for scaffolding. Bamboo scaffolding is still in use in China and Hong Kong. As a scaffolding material, bamboo has a number of advantages. Bamboo is economical and can be simply constructed without special tools. Bamboo scaffolding can also be constructed within a short period of time
25 in a limited working space. The most significant advantage of bamboo scaffolding is its very strong bending strength and elasticity when freshly cut. However, the strength of bamboo decreases as time goes by because it gradually dehydrates over time. When the water content has reduced below 10% the bamboo becomes dry and cracks will appear. The maximum lifespan of bamboo scaffolding members is thus relatively short, only about
30 12 to 18 months. Thus bamboo is considered somewhat unreliable.

Additionally, the types of bamboo typically employed in scaffolding have a surface roughness which assists workers climbing on the scaffolding structure.

35 An additional advantage of bamboo scaffolding is the presence of nodes at regular intervals along the length of each piece of bamboo. These natural protuberances enhance the structural integrity of scaffolding constructed from bamboo. At the junction between

- 2 -

upright and horizontal pieces of bamboo, the nodes help to prevent the horizontal members from slipping down the vertical members. Nevertheless, the use of bamboo in scaffolding structures is still considered a safety risk due to various factors.

5 In view of the limitations of bamboo, it is gradually being superseded in Hong Kong by steel scaffolding members. Steel scaffolding members still possess disadvantages none the least of which is cost. The weight of steel scaffolding structures may also be problematic in some situations. Because of the cost and strength characteristics of steel, the distances between the structural members is generally very wide to reduce material by
10 taking advantage of steel strength. These distances are often inconvenient for workers climbing on the scaffolding.

It would therefore be advantageous if the scaffolding or structural members could be produced which possess the reliability of steel scaffolding members with the advantages
15 of surface roughness and/or spaced nodes possessed by bamboo.

It is therefore an object of the present invention to provide methods of producing structural or scaffolding members which overcome or at least substantially ameliorate some of the above mentioned disadvantages. An alternative object is to provide the public
20 with a useful choice.

Summary of Invention

25 In accordance with a first aspect of the present invention there is provided a method of producing a structural scaffolding member including forming the scaffolding member of reinforced plastics material with appropriate levels of strength and stiffness and providing a gripping surface on the external periphery thereof.

30 The scaffolding member may be formed by any of the known methods for producing reinforced plastics. For example, the process of pultrusion may be incorporated into the method. This process is one whereby the reinforcements eg fibre bundles or tapes are drawn through a liquid thermoset resin bath and simultaneously formed and cured in a heated die from which the cured profile is then withdrawn. This process is not limited to unidirectional reinforcements and indeed the reinforcements can be bought into the profile
35 in any desired orientation.

In a preferred form of the invention, the scaffolding member is produced by a process

- 3 -

known as filament winding. In this process, the reinforcing fibres are drawn through a liquid resin bath and applied to a rotating mould surface or mandrel. The scaffolding members in the present invention are preferably elongate tubes of substantially uniform section and thus the method of filament winding is particularly adapted for use in the present invention. However, the invention is not limited to the production of tubes and it may be economic to produce scaffolding members in the form of solid rods. Furthermore, the tubes or rods may be of any section such as circular, square or rectangular and need not be substantially uniform. For example, the cross-sectional thickness may increase along the length of the scaffolding members to enable the members to be used in upright orientation with the thicker ends at the base to provide additional strength.

The method of the invention is also not restricted to making the whole scaffolding member of reinforced plastics material. For instance, the reinforced plastics material may be wound around a substrate of another material eg non-reinforced plastics material or any other material to which the reinforced plastics material can be bonded.

The scaffolding members produced by the present invention may also be made up of a number of layers. It is not intended that the present invention be restricted to using the same process for each of the layers. For example, an inner substrate layer may be made by a process of pultrusion whereas an outer layer may be formed by filament winding over the pultruded layer. In a most preferred form of the invention, the scaffolding member is formed with four layers of reinforced plastics material each formed by a process of filament winding, with the initial layer wound around a mandrel.

The reinforcements used in the present invention which may be wound, pultruded or otherwise incorporated into the reinforced plastics material may come in any of various forms. The reinforcements may be in strands or bundles commonly referred to as rovings having approximately 60 single glass strands in a bundle treated with a coupling agent to promote adhesion of the glass to the plastic material). Bundles are otherwise referred to as "tows" when graphite or boron reinforcements are incorporated. Single strands, bundles, rovings or tows are particularly adapted for the process of filament winding. However, tapes may also be adapted for filament winding and/or pultrusion and these may be in either woven or unwoven form. The form of tapes is unlimited and even cylindrical mats may be incorporated into a pultrusion process.

Use of glass, graphite and boron fibres have already been mentioned. Aramid fibres may

also be used.

The windings may be conducted at any appropriate angle. As mentioned, it is preferred that the scaffolding member is made up of four layers of reinforced plastics material to provide the appropriate characteristics of strength and stiffness. The first layer (starting from the inside) is preferably formed by filament winding at an angle in the range of 10° and 20° to the longitudinal axis of the scaffolding member. The second layer is preferably wound at an angle in the range of 60° and 65° to the longitudinal axis. The third layer may then be formed by filament windings at an angle in the range of 10° to 20° to the longitudinal axis. The fourth layer may be wound at an angle in the range of 60° to 65° to the longitudinal axis.

The windings may be performed by wet wrapping which is the process described previously whereby the reinforcements are drawn through the resin bath immediately prior to being wound. Alternatively, a process of "prepregs" may also be adopted. This means that the reinforcements are pre-impregnated with thermosetting resin advanced in cure only through the B-stage.

The gripping surface may be formed on the external periphery of the scaffolding member by an applied medium. Preferably, the applied medium is granular material such as grit or sand which forms a coarse layer on the scaffolding member. However, other materials may be achieved to create the gripping surface. For example, a rough surface may be applied by chemical etching. Moreover, the invention is not limited to the use of applied mediums to create the gripping surface and mechanical processes such as scoring or knurling may be used to form the gripping surface.

The applied medium such as grit or sand may be applied to the external periphery of the scaffolding member while the resin is still wet. This may be achieved by spraying the granular material with the medium or passing the scaffolding member as formed through a sand pit. Alternatively, the granular material or other applied medium may be affixed by an adhesive. Alternatively, the gripping surface may be formed by the action of sand which is blasted onto the dry external periphery of the scaffolding member. A combination process may also be adapted by the action of sand, some of which adheres to the wet reinforced plastics material and some of which exerts an abrading effect on the external periphery of the reinforced plastics material. In the application of the applied medium, additional reinforcement pieces may be added to enhance the strength of the scaffolding member.

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The applied medium is not restricted to being applied to the external periphery of the scaffolding member. As previously mentioned, the scaffolding member may be made up of a number of layers and the medium may be applied and subsequently covered by another layer of reinforced plastics material with a further layer of the medium being applied as an outer layer. Consider the example of four layers formed by a process of filament winding, the medium may be applied to the third layer of filament winding either before or after winding. Another layer of filament winding is then applied over the top with a final layer of the medium being applied on the external periphery. Multiple layers of the applied medium such as sand means that the gripping surface will be durable and not immediately wear away.

Preferably, the gripping surface extends about the entire periphery of the scaffolding member. Other arrangements are envisaged. For example, the gripping surface may be disposed at regular intervals such as in spaced bands.

An additional feature of the invention is the inclusion of one or more nodes extending from the external periphery of the scaffolding member as will be further explained subsequently.

In accordance with a second aspect of the present invention there is provided a structural scaffolding member formed of reinforced plastics material wherein the scaffolding member has a gripping surface formed on the external periphery.

In accordance with a third aspect of the present invention there is provided a method of producing a structural member including providing a substrate layer of the member having one or more pultrusions and applying an outer layer to the substrate layer such that the outer layer is integrally adhered to the substrate layer and the member is formed with one or more nodes at the external periphery by the presence of the one or more pultrusions.

Preferably, the structural member is produced from reinforced plastics material in which case any of the features described above in connection with the first aspect of the invention may have application here.

In a preferred form of the invention, the pultrusions may be created by one or more formers placed on the substrate layer. For example, the substrate layer may comprise a layer produced by pultrusion or filament winding about a mandrel. Moreover, the substrate layer may itself comprise a number of layers. In a most preferred form of the

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invention, whereby the structural member is made up of four layers of filament wound reinforced plastics material, the formers are placed on the first (inner) wound layer.

5 The formers may comprise any shaped surface. Preferably the formers comprise rings extend about the circumference of the substrate layer. These rings may be split to facilitate their assembly with the substrate layer. These rings need not be continuous and a C-shaped member may suffice to create the desired pultrusion.

10 Once each former is in place, the outer layer may be produced by a process of filament winding over the top of each former.

In a preferred form of the invention the structural member is elongate and a plurality of spaced nodes are formed on the member.

15 In accordance with a fourth aspect of the present invention there is provided a structural member including a substrate layer having one or more protrusions with an outer layer integrally adhered to the substrate layer such that the member is formed with one or more nodes at the external periphery by the presence of the one or more protrusions.

20 In accordance with a fifth aspect of the present invention there is provided a method of producing a structural member including forming the member from reinforced plastics material which is wound to define one or more nodes at the external periphery thereof.

Thus, the nodes are not limited to being created by formers placed on a substrate layer.

25 For example, the fifth aspect of the present invention includes within its scope, nodes being formed by the provision of a shaped mandrel such that when the reinforced plastics material is wound about the mandrel the nodes are automatically created. Furthermore, the nodes may be created by a buildup of the wound reinforcements. For example, in a normal helical winding pattern, there may be a deviation from the normal pattern at a
30 predetermined location to wind circularly to build up material at that location, thereby creating a node. Non-geodesic winding patterns may also be adopted to create the nodes.

35 In accordance with a sixth aspect of the present invention there is provided a structural member formed of reinforced plastics material wherein the reinforcement is wound to define one or more nodes at the external periphery thereof.

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The structural member defined above and in connection with the third aspect of the invention may have particular application as scaffolding members. However these aspects of the invention are not restricted in this regard and may be useful as structural members for other applications including temporary or semi-permanent bridge structures, viewing platforms, temporary shelters, etc.

This invention may also be said broadly to consist in the parts, elements and features referred to or indicated in the specification of the application, individually or collectively, and any or all combinations of any two or more said parts, elements or features, and where specific integers are mentioned herein which have known equivalents in the art to which this invention relates, such known equivalents are deemed to be incorporated herein as if individually set forth.

The invention consists in the foregoing and also envisages constructions of which the following gives examples only.

Brief Summary of the Drawings

In order that the invention may be more fully understood, one embodiment will now be described by way of example with reference to the drawings in which:

Figure 1 is a perspective view of a conventional form of scaffolding;

Figure 2 is a schematic cross-sectional view of a scaffolding member constructed in accordance with a preferred embodiment of the present invention;

Figure 3 is a schematic side view of the scaffolding member shown in Figure 2; and

Figure 4 is a schematic part-sectional view of a typical scaffolding junction incorporating the scaffolding member shown in Figure 2.

Preferred Embodiment of the Invention

Figure 1 illustrates a typical scaffolding assembly 10 comprising a matrix of upright scaffolding members 12 and transverse members 14. The scaffolding members 12 and 14 are joined at the intersections by couplings 16. In the preferred embodiment in the invention as will be illustrated in connection with Figures 2 to 4, the upright scaffolding members incorporate spaced nodes to mitigate the likelihood of the couplings 16 sliding down the upright scaffolding members and hence maintain the transverse members 14 in position. It will be understood that this feature improves the structural integrity of the scaffolding structure.

As shown in the schematic cross-sectional illustration of Figure 2, the preferred embodiment of the scaffolding member 20 includes a first layer 22 of reinforced plastics material. This first layer 22 is formed by a process of filament winding by winding the resin impregnated reinforcements such as strands or bundles around a central mandrel (not shown). The first layer is wound at an angle in the range of 10° and 20° from the longitudinal axis.

The first layer 22 thus forms a substrate. When this substrate is dry or at least partially dry, a number of formers are placed around the substrate or first layer 22 at regular intervals along the length of the substrate 22.

A second layer 26 of reinforced plastics material is then formed about the combined substrate layer 22 and rings 24 by a process of filament winding. The angle of the windings is in the range of 60° to 65° from the longitudinal axis of the member 20. When this second layer 26 is dry or at least partially dry, a third layer 28 of reinforced plastics material is then formed about the second layer 26. This layer 28 is again formed by a process of filament winding with the windings conducted in the range of 10° and 20° from the longitudinal axis of the member 20.

As the resin in the third layer 28 is curing, sand is applied to coat the third layer 28, thus building up a layer of sand 30. A fourth layer 32 of reinforced plastics material is then provided by a process of filament winding at an angle in the range of 60° to 65° from the longitudinal axis of the member 20. Again, another layer 34 of sand is sprayed onto the fourth layer 32 while the resin in the fourth layer is curing. The sand provides a gripping surface at the external periphery of the scaffolding member 20, enabling workers to more safely climb the scaffolding structure. Multiple layers 30, 34 of sand are provided so that even if the outer layer 34 is worn, the other layer 30 will still provide the gripping surface.

Figure 3 is a side view of the scaffolding member 20 having a length dimension A of approximately 6 metres. The rings 24 are placed onto the substrate layer 22 spaced apart a distance B of approximately 750 mm so it can be seen from Figure 3 that the distance B between adjacent nodes 40 is approximately 750 mm apart. The transverse scaffolding members are secured by the couplers 16 to the upright scaffolding members. The spacing between adjacent transverse scaffolding members which is determined by the node spacing is thus a comfortable distance for workers to climb the scaffolding structure. The dimension C, the diameter of the scaffolding member 20, may be anywhere between approximately 38 and 46 mm the dimension D, the outer circumference of the nodes 40,

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may be anywhere between approximately 40 and 48 mm.

5 Preferably, the relationship between the normal circumference of the scaffolding member 20 and the external circumference of the nodes 40 is such that a coupling in an untightened configuration can easily pass over the nodes 40 but can be tightened and reduced in diameter for securement to the scaffolding member 20 so that it is no longer able to pass over the nodes 40.

10 Figure 4 illustrates a typical junction between an upright scaffolding member 20 constructed in accordance with the present invention and a transverse structural member 14. The structural member 14 preferably has a gripping surface provided on the external periphery. The nodes 40 may be omitted in the transverse members.

15 A portion of the coupling can be seen in Figure 4. The coupling 16 includes a sleeve surrounding the external periphery of the upright scaffolding member 20. It can be seen that downward slippage of the sleeve is prevented by the presence of the node 40. The couplings 16 will thus operate effectively even if the coupling is not completely tight about the scaffolding member 20 resulting in a more structurally sound and safer
20 scaffolding structure. Furthermore, since the need for tightly securing the couplings 16 is overcome, the strain and wear on the couplings 16 will be reduced and their life span will be increased.

25 The above describes only one embodiment of the present invention and modifications can be made thereto without departing from the scope of the present invention as defined in the claims.

THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS:

- 5 1. A method of producing a structural scaffolding member including forming the scaffolding member of reinforced plastics material with appropriate levels of strength and stiffness and providing a gripping surface on the external periphery thereof.
- 10 2. The method as claimed in any one of the preceding claims including forming the gripping surface by the effect of an applied medium.
3. The method as claimed in claim 2 including a process of winding reinforcements to form the scaffolding member.
- 15 4. The method as claimed in claim 3 including applying the medium to the reinforcements after winding.
5. The method as claimed in any one of the preceding claims including applying the medium to the reinforcements prior to winding.
- 20 6. The method as claimed in any one of claims 3 to 5 including applying at least two layers of the medium and providing an intervening layer of reinforcements.
- 25 7. The method as claimed in claim 6 wherein the intervening layer is formed by winding reinforcements.
8. The method as claimed in any one of the preceding claims wherein a process of pultrusion is incorporated.
- 30 9. The method as claimed in any one of the preceding claims wherein the applied medium is sand or grit.
10. The method as claimed in any one of the preceding claims including forming the gripping surface to extend about the whole periphery of the scaffolding member.
- 35 11. The method as claimed in any one of the preceding claims including forming one or more nodes extending from the external periphery of the scaffolding member.

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12. The method as claimed in claim 11 wherein the or each node is formed by incorporating a former and winding reinforcements over the top of the former.

13. A structural scaffolding member formed of reinforced plastics material wherein the scaffolding member has a gripping surface formed on the external periphery.

14. The scaffolding member as claimed in claim 13, including wound reinforcements.

15. The scaffolding member as claimed in claim 13 or claim 14, including pultruded reinforced plastics material.

16. The scaffolding member as claimed in any one of claims 13 to 15, wherein the gripping surface is the effect of an applied medium.

17. The scaffolding member as claimed in claim 16, wherein the medium is applied to an outer layer of wound reinforcements.

18. The scaffolding member as claimed in claim 16 or 17 wherein there are two layers of the applied medium with an intervening layer of wound reinforcements.

19. The scaffolding member as claimed in any one of claims 16 to 18, wherein the applied medium is sand or grit.

20. The scaffolding member as claimed in any one of claims 13 to 19, wherein the gripping surface extends for substantially the external periphery of the scaffolding member.

21. The scaffolding member as claimed in any one of claims 13 to 20, wherein the scaffolding member is elongate with one or more nodes formed to extend from the external periphery.

22. The scaffolding member as claimed in claim 21, wherein the or each node extends transversely to the longitudinal axis of the scaffolding member.

23. A method of producing a structural member including providing a substrate layer of the member having one or more protrusions and applying an outer layer to the substrate layer such that the outer layer is integrally adhered to the substrate layer and the member

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is formed with one or more nodes at the external periphery by the presence of the one or more protrusions.

24. The method as claimed in claim 23 including forming the substrate layer from reinforced plastics material.

25. The method as claimed in claim 24 including forming the substrate layer by winding reinforcements.

26. The method as claimed in claim 24 including forming the substrate layer by a process of pultrusion.

27. The method as claimed in any one of claims 23 to 26 wherein one or more formers are placed on the substrate layer to create the or each protrusion.

28. The method as claimed in claim 27 wherein the outer layer is formed from reinforced plastics material by winding reinforcements over the or each former to create the nodes.

29. The method as claimed in any one of claims 23 to 28 wherein the member is elongate and there are a plurality of spaced nodes, each of which is shaped like a ring extending transversely to the axis of the member.

30. A method of producing a structural member including forming the member from reinforced plastics material which is wound to define one or more nodes at the external periphery thereof.

31. A structural member including a substrate layer having one or more protrusions with an outer layer integrally adhered to the substrate layer such that the member is formed with one or more nodes at the external periphery by the presence of the one or more protrusions.

32. The structural member as claimed in claim 31 wherein the substrate layer is formed from reinforced plastics material.

33. The structural member as claimed in claim 32 wherein the substrate layer has wound reinforcements.

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34. The structural member as claimed in claim 32 wherein the substrate layer is pultruded.

5 35. The structural member as claimed in any one of claims 31 to 34 wherein the or each protrusion is defined by one or more formers placed on the substrate layer.

36. The structural member as claimed in claim 35 wherein the outer layer is formed from reinforced plastics material with reinforcements wound over the or each former.

10 37. The structural member as claimed in any one of claims 31 to 36 wherein the member is elongate and there are a plurality of spaced nodes, each of which is shaped like a ring extending transversely to the axis of the structural member.

15 38. A structural member formed of reinforced plastics material wherein the reinforcement is wound to define one or more nodes at the external periphery thereof.

20 39. The structural member as claimed in claim 38 wherein the member is elongate and there are a plurality of spaced nodes, each of which is shaped like a ring extending transversely to the axis of the structural member.

40. A method of producing a structural member substantially as hereinbefore described with reference to the accompanying drawings.

25 41. A structural member substantially as hereinbefore described with reference to the accompanying drawings.

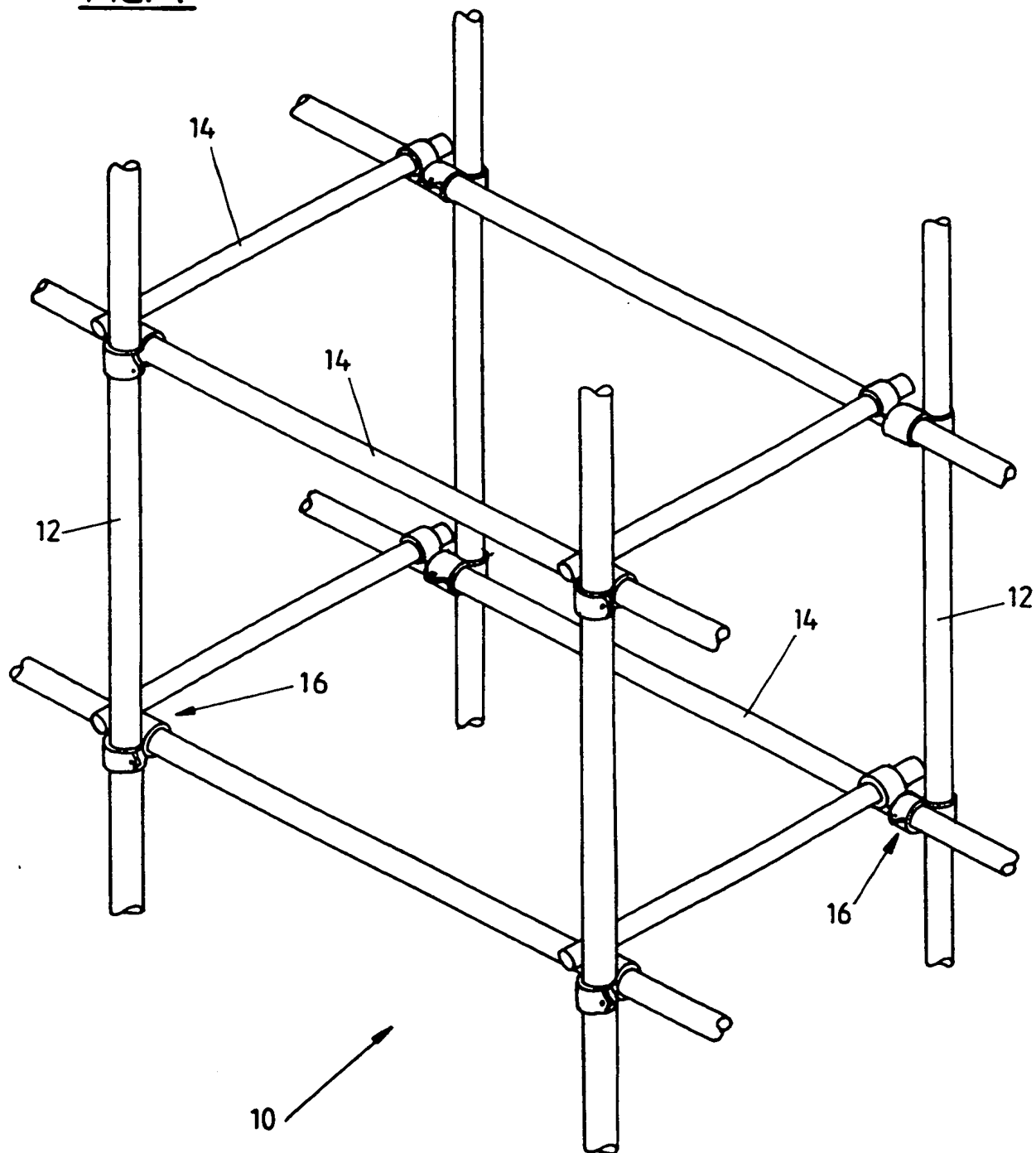
FIG. 1

FIG. 2

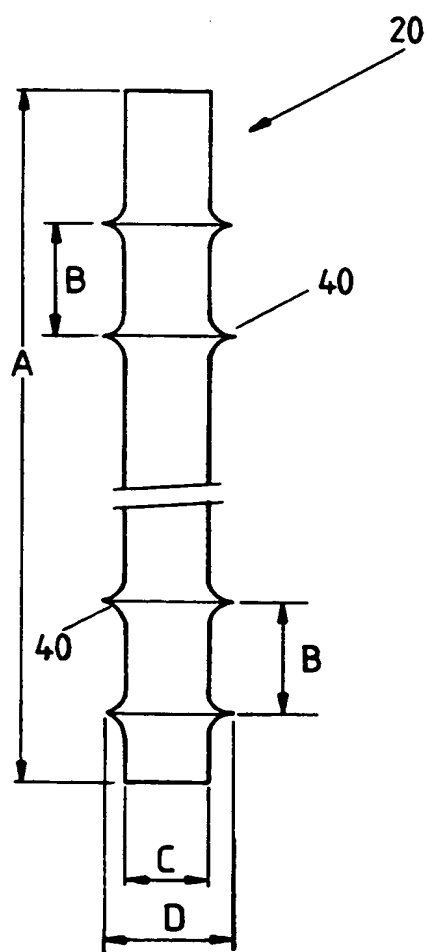
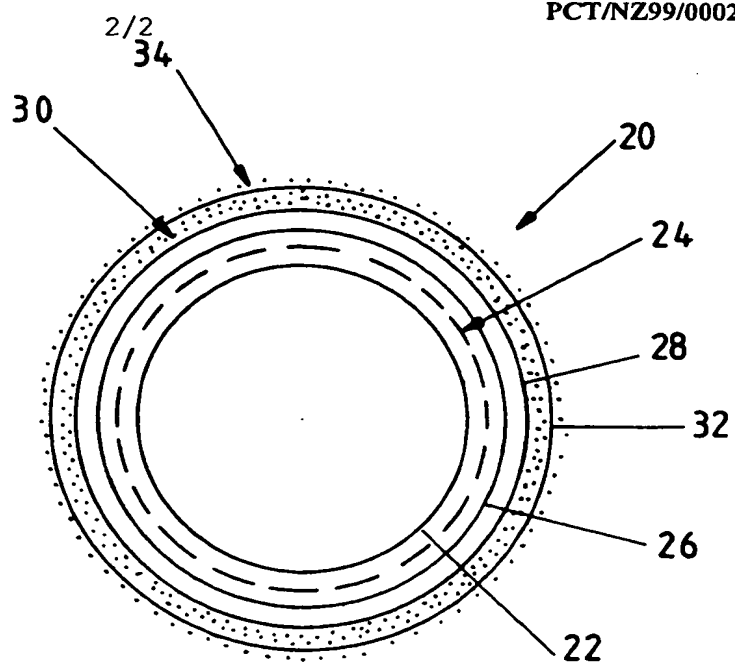


FIG. 3

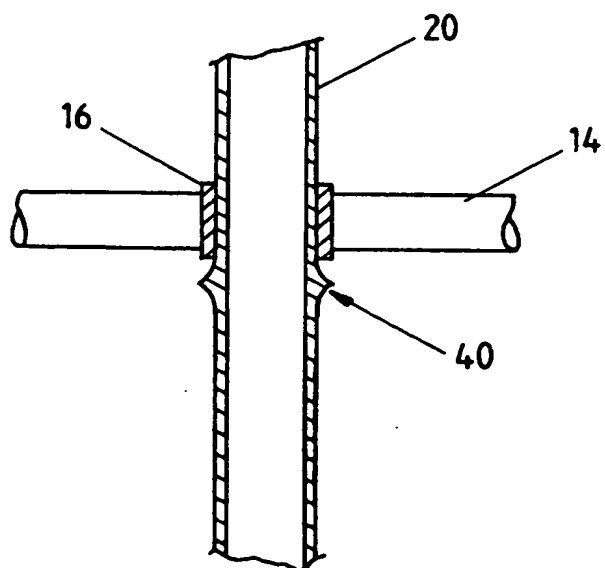


FIG. 4

INTERNATIONAL SEARCH REPORT

International application No.
PCT/NZ 99/00025

A. CLASSIFICATION OF SUBJECT MATTER												
Int Cl ⁶ : E04G 1/02, 1/12, E04C 3/28												
According to International Patent Classification (IPC) or to both national classification and IPC												
B. FIELDS SEARCHED												
Minimum documentation searched (classification system followed by classification symbols) IPC: E04G, E04C												
Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched												
Electronic data base consulted during the international search (name of data base and, where practicable, search terms used) wpat & japio + keywords(scaffold, plastic, synthetic, polymer, reinforce, post, pole, pipe, sand, grit, bamboo, protrusion, node, corrugate, knurl, knot, knob)												
C. DOCUMENTS CONSIDERED TO BE RELEVANT												
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.										
X	GB 2282096 A (SINGAPORE INSTITUTE OF STANDARDS AND INDUSTRIAL RESEARCH) 29 March 1995 figure 1	1,10,11,13,21,22										
X	FR 2229015 A (BAUDESSON Pierre) 10 January 1975 figure A	1,13										
X	US 5566985 A (MOORE et al.) 22 October 1996 figure 1	23,24,31,32										
<input checked="" type="checkbox"/> Further documents are listed in the continuation of Box C <input checked="" type="checkbox"/> See patent family annex												
<p>* Special categories of cited documents:</p> <table border="0"> <tr> <td>"A" document defining the general state of the art which is not considered to be of particular relevance</td> <td>"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention</td> </tr> <tr> <td>"E" earlier application or patent but published on or after the international filing date</td> <td>"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone</td> </tr> <tr> <td>"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)</td> <td>"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art</td> </tr> <tr> <td>"O" document referring to an oral disclosure, use, exhibition or other means</td> <td>"&" document member of the same patent family</td> </tr> <tr> <td>"P" document published prior to the international filing date but later than the priority date claimed</td> <td></td> </tr> </table>			"A" document defining the general state of the art which is not considered to be of particular relevance	"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention	"E" earlier application or patent but published on or after the international filing date	"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone	"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art	"O" document referring to an oral disclosure, use, exhibition or other means	"&" document member of the same patent family	"P" document published prior to the international filing date but later than the priority date claimed	
"A" document defining the general state of the art which is not considered to be of particular relevance	"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention											
"E" earlier application or patent but published on or after the international filing date	"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone											
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art											
"O" document referring to an oral disclosure, use, exhibition or other means	"&" document member of the same patent family											
"P" document published prior to the international filing date but later than the priority date claimed												
Date of the actual completion of the international search 21 July 1999		Date of mailing of the international search report -3 AUG 1999										
Name and mailing address of the ISA/AU AUSTRALIAN PATENT OFFICE PO BOX 200 WODEN ACT 2606 AUSTRALIA Facsimile No.: (02) 6285 3929		Authorized officer GEOFF SADLIER Telephone No.: (02) 6283 2114										

INTERNATIONAL SEARCH REPORT

International application No.
PCT/NZ 99/00025

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	Derwent abstract accession No 98-430762/37, class A32, A88, JP 10178948 A (KANAZAWAT) 7 July 1998	30,38,39
A	DE 4329604 A1 (HILL Stefan) 9 March 1995 whole document	
A	US 4238435 A (LIEBISCH) 9 December 1980 figure 1	
A	US 3826285 A (REYNOLDS) 30 July 1974 figure 1	
A	US 4231834 A (TREJO GONZALEZ) 4 November 1980 figures 2-4	
A	US 3632273 A (SAVICKAS Anthony P) 4 January 1972	

INTERNATIONAL SEARCH REPORT

International application No.
PCT/NZ 99/00025

Box 1 **Observations where certain claims were found unsearchable (Continuation of item 1 of first sheet)**

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:

2. ☐ Claims Nos.:
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:

3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a)

Box II **Observations where unity of invention is lacking (Continuation of item 2 of first sheet)**

This International Searching Authority found multiple inventions in this international application, as follows:

See separate sheet.

1. ☒ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims
2. ☐ As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.
3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:

4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest

- ☐ The additional search fees were accompanied by the applicant's protest.
- ☐ No protest accompanied the payment of additional search fees.

INTERNATIONAL SEARCH REPORT

International application No.

PCT/NZ 99/00025

Box II continued

The international application does not comply with the requirements of unity of invention because it does not relate to one invention or to a group of inventions so linked as to form a single general inventive concept. In coming to this conclusion the International Searching Authority has found that there are different inventions as follows:

1. Claims 1-22 are directed to a structural scaffolding member and its method of production. It is considered that being formed from reinforced plastic and having a gripping surface on an external periphery comprises a first "special technical feature".
2. Claims 23-39 are directed to a structural member and its method of production. It is considered that the presence of surface protrusions or nodes comprises a second "special technical feature".

Since the abovementioned groups of claims do not share any of the technical features identified, a "technical relationship" between the inventions, as defined in PCT rule 13.2 does not exist. Accordingly the international application does not relate to one invention or to a single inventive concept, a priori.

INTERNATIONAL SEARCH REPORT **Information on patent family members**

International application No.
PCT/NZ 99/00025

This Annex lists the known "A" publication level patent family members relating to the patent documents cited in the above-mentioned international search report. The Australian Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

Patent Document Cited in Search Report				Patent Family Member			
GB	2282096	SG	47855				
FR	2229015						
US	5566985						
JP	10178948						
DE	4329604						
US	4238435	DE	2834210	FR	2399909	GB	2003418
		NL	7808277	JP	54040865		
US	3826285						
US	4231834	AR	221216	AT	3796/81	AT	3359/78
		BE	867635	BR	7802592	CA	1112415
		DE	2818057	DK	2219/78	FR	2398595
		IT	1095871	JP	53149277	KE	3228
		ZA	7802619	MX	148691	MX	158445
		US	3632273	SE	7804658	GB	1595847
		CH	632182	AU	36390/78		
END OF ANNEX							

PCT

NOTIFICATION OF ELECTION

(PCT Rule 61.2)

From the INTERNATIONAL BUREAU

To:

Assistant Commissioner for Patents
United States Patent and Trademark
Office
Box PCT
Washington, D.C.20231
ETATS-UNIS D'AMERIQUE

in its capacity as elected Office

Date of mailing (day/month/year) 19 October 2000 (19.10.00)	
International application No. PCT/NZ99/00025	Applicant's or agent's file reference P402168/TJH
International filing date (day/month/year) 26 February 1999 (26.02.99)	Priority date (day/month/year)
Applicant SO, Yu, Shing	

1. The designated Office is hereby notified of its election made:

☒ in the demand filed with the International Preliminary Examining Authority on:

26 September 2000 (26.09.00)

☐ in a notice effecting later election filed with the International Bureau on:

2. The election ☒ was

☐ was not

made before the expiration of 19 months from the priority date or, where Rule 32 applies, within the time limit under Rule 32.2(b).

The International Bureau of WIPO 34, chemin des Colombettes 1211 Geneva 20, Switzerland	Authorized officer R. E. Stoffel
Facsimile No.: (41-22) 740.14.35	Telephone No.: (41-22) 338.83.38

Form PCT/IB/331 (July 1992)

NZ9900025

PATENT COOPERATION TREATY

BEST AVAILABLE COPY

PCT

From the INTERNATIONAL BUREAU

NOTIFICATION OF THE RECORDING
OF A CHANGE(PCT Rule 92bis.1 and
Administrative Instructions, Section 422)

To:

CALHOUN, Douglas, C.
A J Park & Son
Huddart Parker Building
6th floor, Post Office Square
P.O. Box 949
Wellington 6015
NOUVELLE-ZÉLANDE

Date of mailing (day/month/year) 21 December 2000 (21.12.00)	IMPORTANT NOTIFICATION
Applicant's or agent's file reference P402168/TJH	
International application No. PCT/NZ99/00025	International filing date (day/month/year) 26 February 1999 (26.02.99)

1. The following indications appeared on record concerning: <input checked="" type="checkbox"/> the applicant <input type="checkbox"/> the inventor <input type="checkbox"/> the agent <input type="checkbox"/> the common representative		
Name and Address THOMSON, Keith, Charles 32 Tinakora Road Thorndon Wellington New Zealand	State of Nationality NZ	State of Residence NZ
	Telephone No.	
	Facsimile No.	
	Teleprinter No.	
2. The International Bureau hereby notifies the applicant that the following change has been recorded concerning: <input type="checkbox"/> the person <input type="checkbox"/> the name <input type="checkbox"/> the address <input type="checkbox"/> the nationality <input type="checkbox"/> the residence		
Name and Address	State of Nationality	State of Residence
	Telephone No.	
	Facsimile No.	
	Teleprinter No.	
3. Further observations, if necessary: Please note that the above-mentioned applicant in Box 1 has been deleted from our records.		
4. A copy of this notification has been sent to: <input checked="" type="checkbox"/> the receiving Office <input type="checkbox"/> the designated Offices concerned <input type="checkbox"/> the International Searching Authority <input checked="" type="checkbox"/> the elected Offices concerned <input checked="" type="checkbox"/> the International Preliminary Examining Authority <input checked="" type="checkbox"/> other: THOMSON, Keith, Charles		
The International Bureau of WIPO 34, chemin des Colombettes 1211 Geneva 20, Switzerland Facsimile No.: (41-22) 740.14.35		Authorized officer A. Karkachi Telephone No.: (41-22) 338.83.38

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TENT COOPERATION TREATY

PCT

INTERNATIONAL SEARCH REPORT

(PCT Article 18 and Rules 43 and 44)

Applicant's or agent's file reference P402168/TJH	<div style="display: flex; justify-content: space-between;"> <div style="text-align: center;">FOR FURTHER ACTION</div> <div>see Notification of Transmittal of International Search Report (Form PCT/ISA/220) as well as, where applicable, item 5 below.</div> </div>	
International application No. PCT/NZ 99/00025	International filing date (day/month/year) 26 February 1999	(Earliest) Priority Date (day/month/year)
Applicant WUI LOONG SYSTEM SCAFFOLDS COMPANY LIMITED; et al.		

This international search report has been prepared by this International Searching Authority and is transmitted to the applicant according to Article 18. A copy is being transmitted to the International Bureau.

This international search report consists of a total of 6 sheets.

☐ It is also accompanied by a copy of each prior art document cited in this report.

1. Basis of the report

- a. With regard to the language, the international search was carried out on the basis of the international application in the language in which it was filed, unless otherwise indicated under this item.

☐ the international search was carried out on the basis of a translation of the international application furnished to this Authority (Rule 23.1(b)).

- b. With regard to any nucleotide and/or amino acid sequence disclosed in the international application, the international search was carried out on the basis of the sequence listing:

☐ contained in the international application in written form.

☐ filed together with the international application in computer readable form.

☐ furnished subsequently to this Authority in written form.

☐ furnished subsequently to this Authority in computer readable form.

☐ the statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.

☐ the statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished

2. ☐ Certain claims were found unsearchable (See Box I).

3. ☒ Unity of invention is lacking (See Box II).

4. With regard to the title, ☒ the text is approved as submitted by the applicant.

☐ the text has been established by this Authority to read as follows:

5. With regard to the abstract, ☒ the text is approved as submitted by the applicant

☐ the text has been established, according to Rule 38.2(b), by this Authority as it appears in Box III. The applicant may, within one month from the date of mailing of this international search report, submit comments to this Authority.

6. The figure of the drawings to be published with the abstract is Figure No. 4

☒ as suggested by the applicant.

☐ because the applicant failed to suggest a figure

☐ because this figure better characterizes the invention

☐ None of the figures

Box I Observations where certain claims were found unsearchable (Continuation of item 1 of first sheet)

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:
2. ☐ Claims Nos.:
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:
3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a)

Box II Observations where unity of invention is lacking (Continuation of item 2 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

See separate sheet.

1. ☒ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims
2. ☐ As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.
3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:
4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest

- ☐ The additional search fees were accompanied by the applicant's protest.
- ☐ No protest accompanied the payment of additional search fees.

INTERNATIONAL SEARCH REPORT

International application No.

PCT/NZ 99/00025

A. CLASSIFICATION OF SUBJECT MATTERInt Cl⁶: E04G 1/02, 1/12, E04C 3/28

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC: E04G, E04C

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
 wpat & japio + keywords(scaffold, plastic, synthetic, polymer, reinforce, post, pole, pipe, sand, grit, bamboo, protrusion, node, corrugate, knurl, knot, knob)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	GB 2282096 A (SINGAPORE INSTITUTE OF STANDARDS AND INDUSTRIAL RESEARCH) 29 March 1995 figure 1	1,10,11,13,21,22
X	FR 2229015 A (BAUDESSON Pierre) 10 January 1975 figure A	1,13
X	US 5566985 A (MOORE et al.) 22 October 1996 figure 1	23,24,31,32

☒ Further documents are listed in the continuation of Box C

☒ See patent family annex

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance
 "E" earlier application or patent but published on or after the international filing date
 "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
 "O" document referring to an oral disclosure, use, exhibition or other means
 "P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
 "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
 "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
 "&" document member of the same patent family

Date of the actual completion of the international search
 21 July 1999

Date of mailing of the international search report

-3 AUG 1999

Name and mailing address of the ISA/AU
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INTERNATIONAL SEARCH REPORT

International application No.

PCT/NZ 99/00025

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	Derwent abstract accession No 98-430762/37, class A32, A88, JP 10178948 A (KANAZAWAT) 7 July 1998	30,38,39
A	DE 4329604 A1 (HILL Stefan) 9 March 1995 whole document	
A	US 4238435 A (LIEBISCH) 9 December 1980 figure 1	
A	US 3826285 A (REYNOLDS) 30 July 1974 figure 1	
A	US 4231834 A (TREJO GONZALEZ) 4 November 1980 figures 2-4	
A	US 3632273 A (SAVICKAS Anthony P) 4 January 1972	

Box II continued

The international application does not comply with the requirements of unity of invention because it does not relate to one invention or to a group of inventions so linked as to form a single general inventive concept. In coming to this conclusion the International Searching Authority has found that there are different inventions as follows:

1. Claims 1-22 are directed to a structural scaffolding member and its method of production. It is considered that being formed from reinforced plastic and having a gripping surface on an external periphery comprises a first "special technical feature".
2. Claims 23-39 are directed to a structural member and its method of production. It is considered that the presence of surface protrusions or nodes comprises a second "special technical feature".

Since the abovementioned groups of claims do not share any of the technical features identified, a "technical relationship" between the inventions, as defined in PCT rule 13.2 does not exist. Accordingly the international application does not relate to one invention or to a single inventive concept, a priori.

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.
PCT/NZ 99/00025

This Annex lists the known "A" publication level patent family members relating to the patent documents cited in the above-mentioned international search report. The Australian Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

Patent Document Cited in Search Report		Patent Family Member	
GB	2282096	SG	47855
FR	2229015		
US	5566985		
JP	10178948		
DE	4329604		
US	4238435	DE	2834210
		NL	7808277
		FR	2399909
		GB	2003418
US	3826285	JP	54040865
US	4231834	AR	221216
		BE	867635
		DE	2818057
		IT	1095871
		ZA	7802619
		AT	3796/81
		BR	7802592
		DK	2219/78
		JP	53149277
		MX	148691
		AT	3359/78
		CA	1112415
		FR	2398595
		KE	3228
		MX	158445
		US	3632273
		SE	7804658
		GB	1595847
		CH	632182
		AU	36390/78
END OF ANNEX			

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JC03 Rec'd PCT/PTO 27 AUG 2001
AJ PARK
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LAWYERS & CONSULTANTS
PATENT & TRADE MARK
ATTORNEYS

Date 24 May 2001
To Geoff Sadlier
Of 23642
IP Australia
Patent Office
P O Box 200
Woden
ACT 2606
AUSTRALIA

Facsimile No. 0061 2 6285 3929

Number of pages Including this page

From: Tracey Hendy Facsimile No.: +64 4 472 3358

This fax is for the addressee only and may contain privileged and/or confidential information.

Dear Geoff

WUI LOONG SYSTEM SCAFFOLDS COMPANY LIMITED
International Patent Application No. PCT/NZ99/00025
Our Ref P402168 TJH/dah

We refer to the first Written Opinion dated 27 October 2000. We thank the Examiner for the extension of time granted until 26 May 2001.

In response to the objections raised in the International Preliminary Examination Report, we enclose* new claim pages 10 to 13 to replace existing claim pages 10 to 13 at present on file. We also enclose* a marked-up copy of the amended pages for the Examiner's benefit. We also propose to amend the specification to accord with the amended claims. Accordingly, we enclose* new specifications pages 2, 5-7 to replace the specifications pages 2, 5-7 at present on file. A marked-up copy is also enclosed* for the Examiner's benefit.

Claims 1 and 13 are independent claims of commensurate scope. These claims have now been amended to recite that the gripping surface formed on the external periphery of the scaffolding member is by way of surface roughness. This is supported by the specification at page 4, line 22 which describes various ways that a "rough surface" may be created. The limitation to surface roughness distinguishes independent claims 1 and 13 from the citation of D1 since this UK patent document describes corrugations which are of a wholly different order of magnitude to the surface irregularities which would be included within the term "surface roughness". Accordingly, we submit that claims 1 and 13 are distinguished from the citation raised by the Examiner.

Independent claims 23 and 30 are of commensurate scope. The claims cover a structural member including a substrate layer with one or more protrusions formed on the substrate layer by using one or more formers placed on the substrate layer with an outer (structural) layer integrally adhered to the substrate layer to form one or more nodes at the external periphery.

The Examiner has raised the citation of D3 against these claims (formerly claims 23 and 31). D3 describes two methods of affixing sand to the outer ends of a fibreglass pipe. The sand may be applied while the fibreglass is still liquid, the pipe then being cured to its hardened final state. Alternatively,

the sand may be applied by roughening the ends with sandpaper, applying a coating of epoxy bonding material and then sprinkling the sand over the wet bonding material. To our knowledge, the document does not describe how the enlarged areas are created. There would seem to be no use of formers placed on the substrate layer over which is applied an outer layer of structural material to create the nodes. Accordingly, we believe claims 23 and 30 to be distinguished over D3.

In case the Examiner believes D4 to be relevant to claims 23 and 30, we submit our reading of the abstract. The abstract appears to disclose two cylindrical bodies which may be joined together by joints to form a plastic cylinder. The joints and/or the cylindrical bodies can be formed from a moulding material. This moulding material may contain or be wound with a fibre material. This fibre material provides the reinforcement for the joints and/or the cylindrical bodies. This is simply what is well known in the art of reinforced plastics manufacture. This abstract does not say that the junction between the joint and two cylindrical bodies may be wound over with reinforcing fibre material. Rather, the document simply says that the joint pieces may be made from reinforced fibre material. If any doubt, the benefit should go to the applicant.

We look forward to receiving a favourable response from the Examiner.

Yours faithfully



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Senior Associate

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Encl*

upright and horizontal pieces of bamboo, the nodes help to prevent the horizontal members from slipping down the vertical members. Nevertheless, the use of bamboo in scaffolding structures is still considered a safety risk due to various factors.

5 In view of the limitations of bamboo, it is gradually being superseded in Hong Kong by steel scaffolding members. Steel scaffolding members still possess disadvantages none the least of which is cost. The weight of steel scaffolding structures may also be problematic in some situations. Because of the cost and strength characteristics of steel, the distances between the structural members is generally very wide to reduce material by taking advantage of steel strength. These distances are often inconvenient for workers climbing on the scaffolding.

10 It would therefore be advantageous if the scaffolding or structural members could be produced which possess the reliability of steel scaffolding members with the advantages of surface roughness and/or spaced nodes possessed by bamboo.

15 It is therefore an object of the present invention to provide methods of producing structural or scaffolding members which overcome or at least substantially ameliorate some of the above mentioned disadvantages. An alternative object is to provide the public with a useful choice.

Summary of Invention

25 In accordance with a first aspect of the present invention there is provided a method of producing a structural scaffolding member including forming the scaffolding member of reinforced plastics material with appropriate levels of strength and stiffness and providing a gripping surface on the external periphery thereof.

(in the form of surface roughness)

30 The scaffolding member may be formed by any of the known methods for producing reinforced plastics. For example, the process of pultrusion may be incorporated into the method. This process is one whereby the reinforcements eg fibre bundles or tapes are drawn through a liquid thermoset resin bath and simultaneously formed and cured in a heated die from which the cured profile is then withdrawn. This process is not limited to unidirectional reinforcements and indeed the reinforcements can be brought into the profile in any desired orientation.

35 In a preferred form of the invention, the scaffolding member is produced by a process

The applied medium is not restricted to being applied to the external periphery of the scaffolding member. As previously mentioned, the scaffolding member may be made up of a number of layers and the medium may be applied and subsequently covered by another layer of reinforced plastics material with a further layer of the medium being applied as an outer layer. Consider the example of four layers formed by a process of filament winding, the medium may be applied to the third layer of filament winding either before or after winding. Another layer of filament winding is then applied over the top with a final layer of the medium being applied on the external periphery. Multiple layers of the applied medium such as sand means that the gripping surface will be durable and not immediately wear away.

Preferably, the gripping surface extends about the entire periphery of the scaffolding member. Other arrangements are envisaged. For example, the gripping surface may be disposed at regular intervals such as in spaced bands.

An additional feature of the invention is the inclusion of one or more nodes extending from the external periphery of the scaffolding member as will be further explained subsequently.

In accordance with a second aspect of the present invention there is provided a structural scaffolding member formed of reinforced plastics material wherein the scaffolding member has a gripping surface formed on the external periphery.

in the form of surface roughness
In accordance with a third aspect of the present invention there is provided ^(new claim 23) ~~a method of~~ producing a structural member including providing a substrate layer of the member having one or more pultrusions and applying an outer layer to the substrate layer such that the outer layer is integrally adhered to the substrate layer and the member is formed with one or more nodes at the external periphery by the presence of the one or more pultrusions.

Preferably, the structural member is produced from reinforced plastics material in which case any of the features described above in connection with the first aspect of the invention may have application here.

~~In a preferred form of the invention, the pultrusions may be created by one or more formers placed on the substrate layer. For example, the substrate layer may comprise a layer produced by pultrusion or filament winding about a mandrel. Moreover, the substrate layer may itself comprise a number of layers. In a most preferred form of the~~

invention, whereby the structural member is made up of four layers of filament wound reinforced plastics material, the formers are placed on the first (inner) wound layer.

5 The formers may comprise any shaped surface. Preferably the formers comprise rings extend about the circumference of the substrate layer. These rings may be split to facilitate their assembly with the substrate layer. These rings need not be continuous and a C-shaped member may suffice to create the desired ~~protrusion~~ *protrusion*.

10 Once each former is in place, the outer layer may be produced by a process of filament winding over the top of each former.

In a preferred form of the invention the structural member is elongate and a plurality of spaced nodes are formed on the member.

15 In accordance with a fourth aspect of the present invention there is provided ^(new claim 3b) ~~a structural member including a substrate layer having one or more protrusions with an outer layer integrally adhered to the substrate layer such that the member is formed with one or more nodes at the external periphery by the presence of the one or more protrusions.~~

20 ~~In accordance with a fifth aspect of the present invention there is provided a method of producing a structural member including forming the member from reinforced plastics material which is wound to define one or more nodes at the external periphery thereof.~~

25 ~~Thus, the nodes are not limited to being created by formers placed on a substrate layer. For example, the fifth aspect of the present invention includes within its scope, nodes being formed by the provision of a shaped mandrel such that when the reinforced plastics material is wound about the mandrel the nodes are automatically created. Furthermore, the nodes may be created by a buildup of the wound reinforcements. For example, in a normal helical winding pattern, there may be a deviation from the normal pattern at a predetermined location to wind circularly to build up material at that location, thereby creating a node. Non-geodesic winding patterns may also be adopted to create the nodes.~~

30
35 In accordance with a sixth aspect of the present invention there is provided a structural member formed of reinforced plastics material wherein the reinforcement is wound to define one or more nodes at the external periphery thereof.

The structural member defined above and in connection with the ^{fourth}~~third~~ aspect of the invention may have particular application as scaffolding members. However these aspects of the invention are not restricted in this regard and may be useful as structural members for other applications including temporary or semi-permanent bridge structures, viewing platforms, temporary shelters, etc.

This invention may also be said broadly to consist in the parts, elements and features referred to or indicated in the specification of the application, individually or collectively, and any or all combinations of any two or more said parts, elements or features, and where specific integers are mentioned herein which have known equivalents in the art to which this invention relates, such known equivalents are deemed to be incorporated herein as if individually set forth.

The invention consists in the foregoing and also envisages constructions of which the following gives examples only.

Brief Summary of the Drawings

In order that the invention may be more fully understood, one embodiment will now be described by way of example with reference to the drawings in which:

Figure 1 is a perspective view of a conventional form of scaffolding;

Figure 2 is a schematic cross-sectional view of a scaffolding member constructed in accordance with a preferred embodiment of the present invention;

Figure 3 is a schematic side view of the scaffolding member shown in Figure 2; and

Figure 4 is a schematic part-sectional view of a typical scaffolding junction incorporating the scaffolding member shown in Figure 2.

Preferred Embodiment of the Invention

Figure 1 illustrates a typical scaffolding assembly 10 comprising a matrix of upright scaffolding members 12 and transverse members 14. The scaffolding members 12 and 14 are joined at the intersections by couplings 16. In the preferred embodiment in the invention as will be illustrated in connection with Figures 2 to 4, the upright scaffolding members incorporate spaced nodes to mitigate the likelihood of the couplings 16 sliding down the upright scaffolding members and hence maintain the transverse members 14 in position. It will be understood that this feature improves the structural integrity of the scaffolding structure.

THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS:

1. A method of producing a structural scaffolding member including forming the scaffolding member of reinforced plastics material with appropriate levels of strength and stiffness and providing a gripping surface on the external periphery thereof.
{ in the form of surface roughness
2. The method as claimed in any one of the preceding claims including forming the gripping surface by the effect of an applied medium.
3. The method as claimed in claim 2 including a process of winding reinforcements to form the scaffolding member.
4. The method as claimed in claim 3 including applying the medium to the reinforcements after *the process of* winding.
5. The method as claimed in any one of the preceding claims *2 to 4* including applying the medium ~~to the reinforcements~~ *the process of* prior to winding.
6. The method as claimed in *claim 2* ~~any one of claims 3 to 5~~ including applying at least two layers of the medium and providing an intervening layer of reinforcements.
7. The method as claimed in claim 6 wherein the intervening layer is formed by winding reinforcements.
8. The method as claimed in any one of the preceding claims wherein a process of pultrusion is incorporated.
9. The method as claimed in any one of the preceding claims wherein the applied medium is sand or grit.
10. The method as claimed in any one of the preceding claims including forming the gripping surface to extend about the whole periphery of the scaffolding member.
11. The method as claimed in any one of the preceding claims including forming one or more nodes extending from the external periphery of the scaffolding member.

12. The method as claimed in claim 11 wherein the or each node is formed by incorporating a former and winding reinforcements over the top of the former.

13. A structural scaffolding member formed of reinforced plastics material wherein the scaffolding member has a gripping surface ~~formed~~ on the external periphery.

in the form of surface roughness

14. The scaffolding member as claimed in claim 13, including wound reinforcements.

15. The scaffolding member as claimed in claim 13 or claim 14, including pultruded reinforced plastics material.

16. The scaffolding member as claimed in any one of claims 13 to 15, wherein the gripping surface is the effect of an applied medium.

17. The scaffolding member as claimed in claim 16, wherein the medium is applied to an outer layer of wound reinforcements.

18. The scaffolding member as claimed in claim 16 ~~or 17~~ wherein there are two layers of the applied medium with an intervening layer of wound reinforcements.

19. The scaffolding member as claimed in any one of claims 16 to 18, wherein the applied medium is sand or grit.

20. The scaffolding member as claimed in any one of claims 13 to 19, wherein the gripping surface extends for substantially the external periphery of the scaffolding member.

21. The scaffolding member as claimed in any one of claims 13 to 20, wherein the scaffolding member is elongate with one or more nodes formed to extend from the external periphery.

22. The scaffolding member as claimed in claim 21, wherein the or each node extends transversely to the longitudinal axis of the scaffolding member.

23. A method of producing a structural member including providing a substrate layer of the member *of substantially uniform cross-section, placing one or* having one or more protrusions and applying an outer layer *of structural material* to the substrate layer such that the outer layer is integrally adhered to the substrate layer and the member

more formers on the substrate to create

is formed with one or more nodes at the external periphery by the presence of the one or more protrusions.

24. The method as claimed in claim 23 including forming the substrate layer from reinforced plastics material.

25. The method as claimed in claim 24 including forming the substrate layer by winding reinforcements.

26. The method as claimed in claim 24 including forming the substrate layer by a process of pultrusion.

~~27. The method as claimed in any one of claims 23 to 26 wherein one or more formers are placed on the substrate layer to create the or each protrusion.~~

any one of claims 23 to 26
28. The method as claimed in ~~claim 27~~ wherein the outer layer is formed from reinforced plastics material by winding reinforcements over the or each former to create the nodes.

27
29. The method as claimed in any one of claims 23 to ~~28~~ wherein the member is elongate and there are a plurality of spaced nodes, each of which is shaped like a ring extending transversely to the axis of the member.

~~30. A method of producing a structural member including forming the member from reinforced plastics material which is wound to define one or more nodes at the external periphery thereof.~~

The method as claimed in any one of claims 23 to 28 wherein the structural member is a scaffolding member.

of substantially uniform cross-section
of structural material
31. A structural member including a substrate layer ~~having~~ one or more protrusions with an outer layer integrally adhered to the substrate layer such that the member is formed with one or more nodes at the external periphery by the presence of the one or more protrusions.

formed on the substrate layer by one or more formers placed on the substrate layer and
32. The structural member as claimed in claim ~~31~~ wherein the substrate layer is formed from reinforced plastics material.

31
33. The structural member as claimed in claim ~~32~~ wherein the substrate layer has wound reinforcements.

33

34. The structural member as claimed in claim ~~32~~ wherein the substrate layer is pultruded.

~~33. 35. The structural member as claimed in any one of claims 31 to 34 wherein the or each protrusion is defined by one or more formers placed on the substrate layer.~~

34 36. The structural member as claimed in ^{any one of claims 30 to 33} claim ~~35~~ wherein the outer layer is formed from reinforced plastics material with reinforcements wound over the or each former.

10 35 37. The structural member as claimed in any one of claims ^{30 34} ~~31~~ to ~~36~~ wherein the member is elongate and there are a plurality of spaced nodes, each of which is shaped like a ring extending transversely to the axis of the structural member.

~~38. The structural member as claimed in any one of claims 30 to 35 being a scaffolding member~~

15 38. ~~A structural member formed of reinforced plastics material wherein the reinforcement is wound to define one or more nodes at the external periphery thereof.~~

~~39. The structural member as claimed in claim 38 wherein the member is elongate and there are a plurality of spaced nodes, each of which is shaped like a ring extending transversely to the axis of the structural member~~

20 40. A method of producing a structural member substantially as hereinbefore described with reference to the accompanying drawings.

25 41. ~~A structural member substantially as hereinbefore described with reference to the accompanying drawings.~~

upright and horizontal pieces of bamboo, the nodes help to prevent the horizontal members from slipping down the vertical members. Nevertheless, the use of bamboo in scaffolding structures is still considered a safety risk due to various factors.

5 In view of the limitations of bamboo, it is gradually being superseded in Hong Kong by steel scaffolding members. Steel scaffolding members still possess disadvantages none the least of which is cost. The weight of steel scaffolding structures may also be problematic in some situations. Because of the cost and strength characteristics of steel, the distances between the structural members is generally very wide to reduce material by taking advantage of steel strength. These distances are often inconvenient for workers climbing on the scaffolding.

10 It would therefore be advantageous if the scaffolding or structural members could be produced which possess the reliability of steel scaffolding members with the advantages of surface roughness and/or spaced nodes possessed by bamboo.

15 It is therefore an object of the present invention to provide methods of producing structural or scaffolding members which overcome or at least substantially ameliorate some of the above mentioned disadvantages. An alternative object is to provide the public with a useful choice.

Summary of Invention

25 In accordance with a first aspect of the present invention there is provided a method of producing a structural scaffolding member including forming the scaffolding member of reinforced plastics material with appropriate levels of strength and stiffness and providing a gripping surface in the form of surface roughness on the external periphery thereof.

30 The scaffolding member may be formed by any of the known methods for producing reinforced plastics. For example, the process of pultrusion may be incorporated into the method. This process is one whereby the reinforcements eg fibre bundles or tapes are drawn through a liquid thermoset resin bath and simultaneously formed and cured in a heated die from which the cured profile is then withdrawn. This process is not limited to unidirectional reinforcements and indeed the reinforcements can be brought into the profile in any desired orientation.

35 In a preferred form of the invention, the scaffolding member is produced by a process

The applied medium is not restricted to being applied to the external periphery of the scaffolding member. As previously mentioned, the scaffolding member may be made up of a number of layers and the medium may be applied and subsequently covered by another layer of reinforced plastics material with a further layer of the medium being applied as an outer layer. Consider the example of four layers formed by a process of filament winding, the medium may be applied to the third layer of filament winding either before or after winding. Another layer of filament winding is then applied over the top with a final layer of the medium being applied on the external periphery. Multiple layers of the applied medium such as sand means that the gripping surface will be durable and not immediately wear away.

Preferably, the gripping surface extends about the entire periphery of the scaffolding member. Other arrangements are envisaged. For example, the gripping surface may be disposed at regular intervals such as in spaced bands.

An additional feature of the invention is the inclusion of one or more nodes extending from the external periphery of the scaffolding member as will be further explained subsequently.

In accordance with a second aspect of the present invention there is provided a structural scaffolding member formed of reinforced plastics material wherein the scaffolding member has a gripping surface in the form of surface roughness formed on the external periphery.

In accordance with a third aspect of the present invention there is provided a method of producing a structural member including providing a substrate layer of the member of substantially uniform cross-section, placing one or more formers on the substrate to create one or more protrusions and applying an outer layer of structural material to the substrate layer such that the outer layer is integrally adhered to the substrate layer and the member is formed with one or more nodes at the external periphery by the presence of the one or more protrusions.

Preferably, the structural member is produced from reinforced plastics material in which case any of the features described above in connection with the first aspect of the invention may have application here.

The substrate layer may comprise a layer produced by pultrusion or filament winding

about a mandrel. Moreover, the substrate layer may itself comprise a number of layers. In a most preferred form of the invention, whereby the structural member is made up of four layers of filament wound reinforced plastics material, the formers are placed on the first (inner) wound layer.

5 The formers may comprise any shaped surface. Preferably the formers comprise rings extend about the circumference of the substrate layer. These rings may be split to facilitate their assembly with the substrate layer. These rings need not be continuous and a C-shaped member may suffice to create the desired protrusion.

10 Once each former is in place, the outer layer may be produced by a process of filament winding over the top of each former.

15 In a preferred form of the invention the structural member is elongate and a plurality of spaced nodes are formed on the member.

20 In accordance with a fourth aspect of the present invention there is provided a structural member including a substrate layer of substantially uniform cross-section, one or more protrusions formed on the substrate layer by one or more formers placed on the substrate layer and with an outer layer of structural material integrally adhered to the substrate layer such that the member is formed with one or more nodes at the external periphery by the presence of the one or more protrusions.

25 The structural member defined above and in connection with the fourth aspect of the invention may have particular application as scaffolding members. However these aspects of the invention are not restricted in this regard and may be useful as structural members for other applications including temporary or semi-permanent bridge structures, viewing platforms, temporary shelters, etc.

30 This invention may also be said broadly to consist in the parts, elements and features referred to or indicated in the specification of the application, individually or collectively, and any or all combinations of any two or more said parts, elements or features, and where specific integers are mentioned herein which have known equivalents in the art to which this invention relates, such known equivalents are deemed to be incorporated herein as if
35 individually set forth.

The invention consists in the foregoing and also envisages constructions of which the

following gives examples only.

Brief Summary of the Drawings

- 5 In order that the invention may be more fully understood, one embodiment will now be described by way of example with reference to the drawings in which:

Figure 1 is a perspective view of a conventional form of scaffolding;

Figure 2 is a schematic cross-sectional view of a scaffolding member constructed in accordance with a preferred embodiment of the present invention;

- 10 Figure 3 is a schematic side view of the scaffolding member shown in Figure 2; and

Figure 4 is a schematic part-sectional view of a typical scaffolding junction incorporating the scaffolding member shown in Figure 2.

Preferred Embodiment of the Invention

- 15 Figure 1 illustrates a typical scaffolding assembly 10 comprising a matrix of upright scaffolding members 12 and transverse members 14. The scaffolding members 12 and 14 are joined at the intersections by couplings 16. In the preferred embodiment in the invention as will be illustrated in connection with Figures 2 to 4, the upright scaffolding
- 20 members incorporate spaced nodes to mitigate the likelihood of the couplings 16 sliding down the upright scaffolding members and hence maintain the transverse members 14 in position. It will be understood that this feature improves the structural integrity of the scaffolding structure.

THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS:

5 1. A method of producing a structural scaffolding member including forming the scaffolding member of reinforced plastics material with appropriate levels of strength and stiffness and providing a gripping surface in the form of surface roughness on the external periphery thereof.

10 2. The method as claimed in any one of the preceding claims including forming the gripping surface by the effect of an applied medium.

3. The method as claimed in claim 2 including a process of winding reinforcements to form the scaffolding member.

15 4. The method as claimed in claim 3 including applying the medium to the reinforcements after the process of winding.

20 5. The method as claimed in any one of claims 2 to 4 including applying the medium prior to the process of winding.

6. The method as claimed in claim 2 including applying at least two layers of the medium and providing an intervening layer of reinforcements.

25 7. The method as claimed in claim 6 wherein the intervening layer is formed by winding reinforcements.

8. The method as claimed in any one of the preceding claims wherein a process of pultrusion is incorporated.

30 9. The method as claimed in any one of the preceding claims wherein the applied medium is sand or grit.

35 10. The method as claimed in any one of the preceding claims including forming the gripping surface to extend about the whole periphery of the scaffolding member.

11. The method as claimed in any one of the preceding claims including forming one or more nodes extending from the external periphery of the scaffolding member.

12. The method as claimed in claim 11 wherein the or each node is formed by incorporating a former and winding reinforcements over the top of the former.

5 13. A structural scaffolding member formed of reinforced plastics material wherein the scaffolding member has a gripping surface in the form of surface roughness on the external periphery.

14. The scaffolding member as claimed in claim 13, including wound reinforcements.

10 15. The scaffolding member as claimed in claim 13 or claim 14, including pultruded reinforced plastics material.

16. The scaffolding member as claimed in any one of claims 13 to 15, wherein the gripping surface is the effect of an applied medium.

15 17. The scaffolding member as claimed in claim 16, wherein the medium is applied to an outer layer of wound reinforcements.

20 18. The scaffolding member as claimed in claim 16 wherein there are two layers of the applied medium with an intervening layer of wound reinforcements.

19. The scaffolding member as claimed in any one of claims 16 to 18, wherein the applied medium is sand or grit.

25 20. The scaffolding member as claimed in any one of claims 13 to 19, wherein the gripping surface extends for substantially the external periphery of the scaffolding member.

30 21. The scaffolding member as claimed in any one of claims 13 to 20, wherein the scaffolding member is elongate with one or more nodes formed to extend from the external periphery.

22. The scaffolding member as claimed in claim 21, wherein the or each node extends transversely to the longitudinal axis of the scaffolding member.

35 23. A method of producing a structural member including providing a substrate layer of the member of substantially uniform cross-section, placing one or more formers on the

substrate to create one or more protrusions and applying an outer layer of structural material to the substrate layer such that the outer layer is integrally adhered to the substrate layer and the member is formed with one or more nodes at the external periphery by the presence of the one or more protrusions.

5. 24. The method as claimed in claim 23 including forming the substrate layer from reinforced plastics material.

10 25. The method as claimed in claim 24 including forming the substrate layer by winding reinforcements.

26. The method as claimed in claim 24 including forming the substrate layer by a process of pultrusion.

15 27. The method as claimed in any one of claims 23 to 26 wherein the outer layer is formed from reinforced plastics material by winding reinforcements over the or each former to create the nodes.

20 28. The method as claimed in any one of claims 23 to 27 wherein the member is elongate and there are a plurality of spaced nodes, each of which is shaped like a ring extending transversely to the axis of the member.

25 29. The method as claimed in any one of claims 23 to 28 wherein the structural member is a scaffolding member.

30 30. A structural member including a substrate layer of substantially uniform cross-section, one or more protrusions formed on the substrate layer by one or more formers placed on the substrate layer and with an outer layer of structural material integrally adhered to the substrate layer such that the member is formed with one or more nodes at the external periphery by the presence of the one or more protrusions.

31. The structural member as claimed in claim 30 wherein the substrate layer is formed from reinforced plastics material.

35 32. The structural member as claimed in claim 31 wherein the substrate layer has wound reinforcements.

33. The structural member as claimed in claim 31 wherein the substrate layer is pultruded.

5 34. The structural member as claimed in any one of claims 30 to 33 wherein the outer layer is formed from reinforced plastics material with reinforcements wound over the or each former.

10 35. The structural member as claimed in any one of claims 30 to 34 wherein the member is elongate and there are a plurality of spaced nodes, each of which is shaped like a ring extending transversely to the axis of the structural member.

36. The structural member as claimed in any one of claims 30 to 35 being a scaffolding member.